

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE <div style="text-align: center;">J</div>		PAGE OF PAGES <div style="text-align: center;">1</div>	
2. AMENDMENT/MODIFICATION NO. 0001		3. EFFECTIVE DATE 26-Jul-2002		4. REQUISITION/PURCHASE REQ. NO. N25PHS-2169-9230		5. PROJECT NO.(If applicable)	
6. ISSUED BY CONTRACTING DIVISION WANAMAKER BUILDING 100 PENN SQUARE EAST PHILADELPHIA PA 19107-3390		CODE DACW61		7. ADMINISTERED BY (If other than item 6) US ARMY ENGINEER DISTRICT, PHILADELPHIA POC: SANDI FLETCHER WANAMAKER BUILDING 100 PENN SQUARE EAST PHILADELPHIA PA 19107-3390		CODE E5CTCSGF	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. DACW61-02-B-0026	
				X		9B. DATED (SEE ITEM 11) 8-Jul-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended.							
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
Dike Raising, Wilmington Harbor N.							
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A.THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B.THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C.THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D.OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) THIS AMENDMENT DOES NOT EXTEND THE 7 AUGUST 2002 BID OPENING DATE AT 11:00 AM							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED	

14. DESCRIPTION OF AMENDMENT (continued)

A. SOLICITATION, OFFER, AND AWARD: Section 00010, BIDDING SCHEDULE: Please delete page 00010-3 in its entirety and replace it with the new 00010-3, annotated Amendment No. 0001, attached hereto.

B. SPECIFICATIONS:

1. Section 02230 – SITE CLEARING - Please add this section in its entirety and annotated Amendment No. 0001, attached hereto.

2. Section 02300 – EARTHWORK - Please delete this section in its entirety and replace it with the new section of the same name and number, annotated Amendment No. 0001, attached hereto.

3. Section 02370 – GEOTEXTILES - Please delete this section in its entirety and replace it with the new section of the same name and number, annotated Amendment No. 0001, attached hereto.

4. Project Table of Content- Please delete this Table and replace it with the new Table , annotated Amendment No. 0001, attached hereto.

C. DRAWINGS: Please delete Drawing Numbers 61731, 61732, 61733, 61734, 61735, 61736, 61737, 61738, 61739, and 61740 in their entirety and substitute the revised sheets, of the same Drawing Numbers, with a revision date of 26 July 2002.

D. Please indicate receipt of this amendment on Standard Form 1442 (SOLICITATION, OFFER, AND AWARD) as Amendment No. 0001. Failure to acknowledge all amendments may be cause for rejection.

BIDDING SCHEDULE
(To be attached to Standard Form 1442)

**DIKE RAISING
WILMINGTON HARBOR NORTH
CONFINED DISPOSAL FACILITY
WILMINGTON HARBOR, DELAWARE**

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	UNIT	ESTIMATED AMOUNT
1.	Sluice Access Road	1	Job	L.S.	\$ _____
2.	Geotextile Reinforcement	103,775	S.Y.	\$ _____	\$ _____
3.	Dike Fill	374,550	C.Y.	\$ _____	\$ _____
4.	Sluice Relocation	1	Job	L.S.	\$ _____
5.	<i>Geosynthetic Clay Liner</i>	39,72	<i>S.Y.</i>	<i>\$ _____</i>	<i>\$ _____</i>
TOTAL ESTIMATED AMOUNT					\$ _____

NOTE: Bidders must bid on all items.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

SECTION 02230

SITE CLEARING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The work of this Section shall include the clearing and grubbing of areas within the Limit of Disturbance indicated on the Contract Drawings, as required for completion of the work. Clearing and grubbing shall be limited to that necessary to complete the work. All cleared and grubbed materials shall be temporarily stockpiled in an area specified by the Contracting Officer until completion of the borrow activities, as which time the Contractor shall place the cleared and grubbed materials in the interior of the disposal area. The use of cleared and grubbed materials in the proposed dike fill areas shall not be permitted.

1.2 DEFINITIONS

1.2.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections, and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, and brush present in the areas to be cleared.

1.2.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

1.3 ENVIRONMENTAL PROTECTION

The work shall comply with the requirements of Section 01355, ENVIRONMENTAL PROTECTION.

1.4 BURNING

The use of burning at the project site for the disposal of cleared or grubbed material shall not be permitted.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface.

3.2 GRUBBING

Material to be grubbed shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated within the Limit of Disturbance on the Contract Drawings. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 DISPOSAL OF MATERIALS

All felled timber, logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be temporarily stockpiled at an on-site location designated by the Contracting Officer until completion of all borrow activities. Upon completion of borrow activities, the cleared and grubbed materials shall be placed in the interior of the disposal area at locations designated by the Contracting Officer.

3.4 MEASUREMENT AND PAYMENT

There shall be no measurement or payment for work specified in this section and all costs in connection herewith shall be included in the costs of all the bid items.

-- End of Section --

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

The work specified in this section includes the earthwork activities involved in the excavation of materials from the on-site borrow area, excavation and placement of grading fill, placement of the perimeter and baffle dike fill, **placement of the geosynthetic clay liner (GCL) cover soils**, placement of the aggregate for the sluice access roadway, and placement of backfill materials as part of the sluice relocation.

1.2 DIKE FILL AND GRADING FILL MATERIALS

All dike fill, grading fill, **and GCL cover soil materials** shall be obtained on-site. The use of off-site borrow materials shall not be permitted. Materials available for dike fill, grading fill **and GCL cover soils** shall include materials cut from the existing dikes as part of the perimeter grading or materials excavated from the on-site borrow area indicated on the Contract Drawings. Test boring and test pit logs indicating the subsurface conditions encountered in the vicinity of the existing perimeter dikes and the proposed borrow area, as well as the corresponding test boring and test pit locations, are included on the Contract Drawings. Available laboratory testing data for samples obtained from these test borings and test pits is provided in the tabular summary included at the end of this Section. These data represent the best subsurface information presently available in the vicinity of the proposed construction at the time of the testing and sampling; however, variations may exist in the subsurface between test boring and test pit locations and conditions may have changed since that time.

Based on the conditions encountered in these test borings and test pits and the associated laboratory testing, it is anticipated that a significant portion of the existing shallow soils to be used as dike fill will be available at moisture contents which can be worked and dried to within acceptable placement limits using conventional soil drying techniques. However non-standard excavation techniques typical for use with very soft subgrade soils may be required. Additionally, it is anticipated that a substantial volume of the materials which will need to be excavated from the borrow area and used as dike fill will be present at moisture contents considerably greater than those required for placement as dike fill. The Contractor should anticipate that significant effort will be required to excavate, haul and reduce the moisture content of such soils to acceptable placement levels in these materials.

The project has been designed as a balance cut and fill site. This balance requires the proposed borrow area be graded as indicated on the Contract Drawings to provide the necessary disposal volume and maintain the internal stability of the dikes. Therefore amendment of the on-site soils shall be permitted only if the Contractor can prove, to the satisfaction of the Contracting Officer, that the site grading indicated on the Contract Drawings, including the proposed dike and borrow area grades, can be

achieved. If amendment of site soils is proposed, details for the proposed amendment plan shall be submitted for review and approval as part of the Contractor's Dike Construction Work Plan. The removal of on-site materials from the site shall not be permitted. The Contractor shall review the available information and make their own interpretation of subsurface site conditions. Drying of all soils is time, effort and weather dependent, which shall be considered in the Contractor's bid, scheduling and approach to this work. Stockpiling of site soils exceeding five feet in height shall be limited to areas **along Reach C**, as identified on the Contract Drawings. Stockpiles of less than five feet in height shall be permitted at other locations, as approved by the Contracting Officer. Given the extremely soft subgrade conditions, the Contractor shall assume all risk of subgrade instability arising from any stockpiling of site soils.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

CORPS OF ENGINEERS (COE)

COE EM 1110-1-1005	Topographic Surveying Manual
--------------------	------------------------------

DELAWARE DEPARTMENT OF TRANSPORTATION (DelDOT)

Section 813	(1996 Standard Specifications for Road and Bridge Construction) Grading Requirements, Minimum and Maximum Percentages Passing
Section 821	(1996 Standard Specifications for Road and Bridge Construction) Graded Aggregate

1.4 DEFINITIONS

1.4.1 Satisfactory Fill Materials

Satisfactory materials for dike fill, grading fill, **GCL cover soil** and for use as backfill during installation of the additional sections of the sluice outlet pipe shall comprise any on-site materials classified by ASTM D 2487 as CL, ML, CL-ML, MH, CH, OL or OH containing stones of less than 3

inches in all dimensions.

1.4.2 Unsatisfactory Fill Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include trash; refuse; and material classified as satisfactory which contain frozen material. Unsatisfactory materials shall be disposed of as indicated in Paragraph "BORROW AREA" of this Section of the Specification. The Contracting Officer shall be notified of any unsatisfactory materials.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Sources for Roadway Aggregate; G COR. Roadway Aggregate Gradation Curves; G COR.

The Contractor shall submit to the Contracting Officer for approval, prior to delivery, their proposed source for the roadway aggregate. The test data specified herein for those sources shall be submitted. In the event such data is unavailable, the Contractor shall procure the services of an industry-certified testing laboratory to perform the required acceptance tests. The results of all acceptance tests shall be furnished to the Contracting Officer at least 21 days prior to the delivery of the aggregate to the work site. All testing shall be entirely at the Contractor's expense.

The Contractor shall submit gradation curves to verify that the roadway aggregate meets the requirements specified herein.

Sources for Sluice Relocation Backfill; G COR. Sluice Relocation Backfill Gradation Curves; G COR.

The Contractor shall submit to the Contracting Officer for approval, prior to delivery, their proposed source for the sluice relocation backfill. The test data specified herein for those sources shall be submitted. In the event such data is unavailable, the Contractor shall procure the services of an industry-certified testing laboratory to perform the required acceptance tests. The results of all acceptance tests shall be furnished to the Contracting Officer at least 21 days prior to the delivery of the backfill material to the work site. All testing shall be entirely at the Contractor's expense.

The Contractor shall submit gradation curves to verify that the sluice relocation backfill meets the requirements specified herein.

SD-08 Statements

Dike Construction Work Plan; G COR.

The Contractor shall prepare a Dike Construction Work Plan outlining the proposed equipment and methods to be used in construction of the dikes as required by the Contract Drawings and this Specification. This work plan shall include details regarding phasing of the dike construction and the

proposed methods for excavation of borrow materials from the borrow area, drying of these materials, placement of the geotextile reinforcement, placement and compaction of the dike fill, and borrow area dewatering, if proposed. The plan shall identify proposed stockpile areas, the anticipated moisture testing plan, and a discussion of the timing and coordination of all testing efforts, as well as a complete listing, including make and model number, of all equipment to be used for dike construction, an example of the Contractor's proposed Weekly Dike Fill Placement Summary, and a proposed schedule for submission of the Weekly Dike Fill Placement Summaries. If soil amendment is proposed, this plan shall provide specific details regarding the environmental and geotechnical characteristics of the proposed amendments and provide sufficient data to indicate that the proposed amendment plan will result in a balanced cut and fill at the site as required by Paragraph 1.2. The Dike Construction Work Plan shall be submitted to the Contracting Officer for review and approval a minimum of 21 calendar days prior to the start of earth moving activities.

Weekly Dike Fill Placement Summaries; G COR.

The Contractor shall submit to the Contracting Officer for review and approval weekly summaries of dike fill placement activities. This summary shall include a location sketch indicating the sections of dike, by station, and lifts placed during the subject week. Also included shall be a summary of the results of physical tests performed on the fill place during the subject week, including natural water content and nuclear density testing. These summary reports shall be submitted on a weekly basis, on a day to be agreed upon by the Contractor and Contracting Officer prior to the start of earth moving activities.

SD-09 Reports

Testing Results; G COR.

Within one week of conclusion of physical tests for the roadway aggregate, including proctor tests and nuclear density tests, three copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing Laboratory Qualifications; G COR.

Qualifications of the commercial testing laboratory which will be performing the required testing shall be submitted to the Contracting Officer a minimum of 14 calendar days prior to the start of any laboratory testing.

PART 2 PRODUCTS

2.1 ROADWAY AGGREGATE

Crushed stone placed for the access roadway shall consist of imported materials and shall meet the requirements of Graded Aggregate Type "A" (CR-1) as specified in Section 821 of the Delaware Department of Transportation Standard Specifications.

2.2 SLUICE RELOCATION BACKFILL

Stone backfill placed for the sluice relocation shall consist of imported materials and shall meet the requirements of Delaware No. 3 stone as

specified Section 813 of the Delaware Department of Transportation Standard Specifications.

PART 3 EXECUTION

3.1 DIKE FILL

3.1.1 Sequence of Work

The portions of the dike identified as Reaches A and B on the Contract Drawings shall be constructed and substantially completed, as determined by the Contracting Officer, prior to the start of work on the remaining reach of the project.

3.1.2 Preparation of Ground Surface for Dike Construction

3.1.2.1 General Requirements

Prior to placement of the dike fill, the Contractor shall install settlement plates as indicated on the Contract Drawings and Section 02700 of this specification. The initial lift of dike fill materials shall be placed directly on the geotextile reinforcement. The dike fill shall be placed in accordance with the dike material phasing detail provided on the Contract Drawings to place the reinforcement geotextile in tension and reduce the potential for mudwaves as the dike fill is placed. The Contractor shall demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile. All existing surfaces on or against where fill materials are to be placed shall be scarified to a minimum depth of 6-inches and compacted just prior to placement of the fill material. Compaction of the scarified surfaces shall be as specified in paragraph: "Compaction Operations" of this section. If, in the opinion of the Contracting Officer, any surfaces to receive fill become compacted in such a manner that a plane of seepage or weakness may result, the surface shall be thoroughly broken by making two passes with a track-type tractor prior to the placement of the fill material thereon. All scarification and breaking of surfaces shall be done parallel to the centerline of the proposed dike.

3.1.2.2 Frozen Materials

Dike fill shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Dike material shall not contain frozen clumps of soil, snow, or ice.

3.1.3 Dike Construction

3.1.3.1 General

Unless otherwise specified or directed by the Contracting Officer, the embankment shall be constructed to the lines, grades and slopes shown on the Contract Drawings. The existing dikes shall be excavated to the extent indicated on the Contract Drawings. Material obtained from required excavation of the existing dikes and site grading shall be used as fill material in the dike embankment construction. Under no circumstances shall frozen fill material, snow or ice be placed in the embankment. The Contracting Officer will have the authority to require the wasting of the frozen material at an on-site location at the Contractor's expense. Any erosion of the constructed embankment shall be repaired within two working days.

3.1.3.2 Compacted Fill

Fill material shall be placed and spread in horizontal layers not exceeding 12-inches in thickness prior to compaction. If, in the opinion of the Contracting Officer, the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be scarified to the satisfaction of the Contracting Officer prior to the placement of material thereon.

3.1.3.3 Moisture Control

Moisture content of dike fill material shall be within the limits specified in paragraph: CONTRACTOR QUALITY CONTROL. If the moisture content of the fill material exceeds that required by this Section for use as dike fill, the materials shall be aerated or otherwise dried, as specified in the Contractor's approved Dike Construction Work Plan, until the moisture content is within the specified limits just prior to compaction.

3.1.3.4 Compaction Operations

Surfaces to be compacted shall be free of standing water, ruts and unnecessary roughness. Each layer of fill material shall be compacted by not less than eight passes of a self propelled sheepsfoot roller, where a pass is defined as a pass in one direction. The sheepsfoot roller shall be large enough to be rated with a minimum 100 ton vibratory capacity. However the compaction shall be performed in the static mode. Each pass of the roller shall overlap the preceding or adjacent pass by not less than one foot. Portions of the embankment which cannot be reached by the roller shall be compacted to the density of the surrounding embankment by a method approved by the Contracting Officer. The Contractor shall schedule their daily operations so that all fill material placed in the dike embankment is compacted by eight passes of the roller by the end of the workday.

3.1.3.5 Tolerances

At all points a tolerance of 0.5 foot above the grades shown on the Contract Drawings will be permitted provided that any excess material is distributed so that the crown of the dike drains inward towards the disposal area and there are no abrupt humps or depressions in the surfaces or bulges in the width of the crown. At no point shall the final grade be below the grades shown on the Contract Drawings. Horizontal tolerances shall be within one foot of that indicated on the Contract Drawings.

3.1.3.6 Settlement of the Foundation

If settlement in any portion of the foundation develops to such an extent as to make it advisable, in the opinion of the Contracting Officer, to discontinue placement of fill material and to postpone building of that portion of the dike to full grade and cross section, the Contracting Officer shall have the right to terminate further work on that portion of the dike under this contract.

3.1.3.7 Slides

If sliding of any part of the dike occurs prior to its acceptance, the Contractor shall repair the slide at the direction of the Contracting Officer. Repairs shall consist of providing additional fill material to restore the desired grades and slopes. If the slide is due to the fault of the Contractor or as a direct result of the Contractor's operation, this work shall be performed without cost to the Government. If the slide is not due to the fault of the Contractor and did not result from the Contractor's operation, payment for this work will be made as specified in paragraph: "MEASUREMENT AND PAYMENT".

3.1.3.8 Contractor Quality Control

Moisture density tests shall be performed on fill material in accordance with ASTM D 3017 upon commencement of dike construction, when any change in material occurs, and at a minimum frequency of one test every 200 cubic yards of dike fill placed. All testing shall be performed immediately after compaction of the material to be tested. Moisture content of placed fill shall be between 40% and 56%.

3.1.4 Subgrade and Dike Protection

The dikes shall be kept shaped and drained. Proper drainage around the dikes shall be effectively maintained at all times. Each night precipitation is expected, the dike shall be crowned and the surface lift sealed with two passes of a smooth-drum roller. Scarification of the sealed surface shall be performed prior to subsequent fill placement in accordance with Paragraph 3.1.3.2, Compacted Fill. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until the completion of the project. The storage or stockpiling of materials on the finished dike shall not be permitted. No seeding of the dike or any other areas shall be performed until these areas have been checked and approved by the Contracting Officer.

3.2 GRADING FILL

All grading fill shall be placed and compacted in accordance with the requirements of Paragraphs "Compacted Fill," "Moisture Control," and "Compaction Operations." Moisture content of placed grading fill material shall be between 40% and 56%. Natural moisture content tests shall be performed on grading fill materials in accordance with ASTM D 3017 at a minimum frequency of one test every 500 cubic yards of grading fill placed. All testing shall be performed immediately after compaction of the material to be tested.

3.3 GCL COVER SOIL

All GCL cover soil shall be placed and spread in a single horizontal lift

measuring not less than 18 inches in compacted thickness. Moisture content of placed grading fill material shall be between 40% and 70%. If the moisture content of the cover soil material exceeds that required by this Section for use as GCL cover soil, the materials shall be aerated or otherwise dried until the moisture content is within the specified limits just prior to compaction. Natural moisture content tests shall be performed on GCL cover soil materials in accordance with ASTM D 3017 at a minimum frequency of one test every 500 cubic yards of cover soil placed. All testing shall be performed immediately after compaction of the material to be tested. The cover soil shall be compacted by not less than six passes of self propelled tracked equipment with a minimum ground pressure of 15 psi, where a pass is defined as a pass in one direction. Each pass of the tracked equipment shall overlap the preceding or adjacent pass by not less than six inches.

3.4 SLUICE ACCESS ROADWAY CONSTRUCTION

The access roadway graded aggregate shall be placed directly on the access roadway geotextile. The Contractor shall demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile. The aggregate shall be deposited and spread parallel to the centerline of the roadway. The material shall be handled such that no segregation of fine or coarse materials occurs. The moisture content of the aggregate at the time of compaction shall be within four percentage points of optimum moisture content as determined by ASTM D 1557. Moisture density tests shall be performed on access roadway aggregate in accordance with ASTM D 3017 at a minimum of five locations along the access roadway, as determined by the Contracting Officers. If the moisture content is not within four percentage points of optimum, the material shall either be moistened or dried, as needed, and thoroughly mixed before compaction. Compaction or rolling shall start at the edges and progress toward the center and shall continue until the aggregate is thoroughly and uniformly compacted to the satisfaction of the Contracting Officer.

3.5 SLUICE RELOCATION BACKFILL

Sluice relocation backfill shall be placed in maximum 12 inch thick loose lifts and compacted with the backhoe bucket. Placement of additional compaction equipment into the excavation is not required.

3.6 BORROW AREA

All fill materials shall be obtained on-site, except as specifically noted herein or indicated in the Contractor's approved Dike Construction Work Plan. The use of off-site borrow materials shall be permitted for roadway aggregate and sluice backfill. Materials available for grading and dike fill shall include materials cut from the existing dike and disposal area as part of the perimeter grading or materials from the on-site borrow area indicated on the Contract Drawings. **The required elevation for excavation of borrow materials within the on-site borrow area is elevation 36.5 feet NAVD88. Elevation 36.5 feet NAVD88 is also the Limit of Excavation within the on-site borrow area. Excavation below the final elevations indicated on the Contract Drawings shall not be permitted.** Maintaining satisfactory drainage of the borrow area shall be considered related to the borrow operation. Dewatering of the borrow area shall be permitted. All dewatering operations, if performed, shall be in compliance with the U.S. Army Corps

of Engineers' Water Quality Certification from the Delaware Department of Natural Resources and Environmental Control. If encountered, materials excavated from the borrow area which are not suitable for use as dike fill shall be temporarily stockpiled on-site and placed back within the borrow area at the completion of excavation activities. Slopes at any location within the borrow area shall not be steeper than 3H:1V at the completion of the project.

3.7 MEASUREMENT AND PAYMENT

3.7.1 Dike Fill Measurement

The unit of measurement for dike fill will be cubic yard. The actual in-place dike fill quantity shall be computed for payment by the average end area method from cross sections taken at 250 foot intervals along the length of the perimeter and baffle dikes. Additional sections may be required by the Contracting Officer to evaluate possible low spots between cross section locations. Prior to the start of placement of dike fill, a survey will be performed to determine the existing ground surface elevations along the proposed dike alignments. Another survey of the final dike grades shall be performed following the completion of dike fill placement to confirm the required dike geometry. All surveys shall be performed under the guidance of a surveyor licensed by the State of Delaware. The Contractor shall be responsible for all costs associated with the surveys. The total volume to be paid for dike fill will be the number of cubic yards calculated using the pre-fill and post-fill placement surveys, corrected as necessary based on measurements obtained from the settlement plates installed along the perimeter dike centerline. The settlement plate measurements shall be extrapolated to the baffle dike, as appropriate. The measurement will not include the volume of any fill placed prior to the taking of ground surface elevations of the undisturbed grade, the volume of material resulting from the allowable above-grade tolerance, or the wasting of frozen materials. Excavation will not be measured for payment and all costs in connection therewith shall be included in the contract price of the dike fill as specified in this Section. The measurement of additional fill material required for the repair of slides will be by the cubic yard.

3.7.2 Settlement

Computations based on measurements from the specified settlement plates will be determined as follows:

- a. The settlement measured at each monitoring location will be considered to apply to the foundation area under the dike crown, throughout the length of the settlement measurement range.
- b. The foundation settlement under the dike embankment at each cross-section will be considered to vary uniformly from zero settlement at each toe of the dike to the actual amount of settlement measured at the respective settlement plate. Settlement shall be assumed to vary uniformly between the midpoints of adjacent monitoring devices.
- c. The calculated settlement shall be used to correct the dike fill payment quantity as indicated in Paragraph 3.7.1.

3.7.3 Field Surveys

The Contractor shall be responsible for conducting all field surveys and

performing all computations required for measurement of dike embankment quantities (see Special Clause: "Quantity Surveys"). All surveys shall be in accordance with COE EM 1110-1-1005. The settlement plates shall be surveyed for vertical movement to the nearest 0.1 foot. Surveys shall be obtained immediately following installation of the settlement plates and at intervals determined necessary by the Contractor to permit accurate measurement of fill material placed during construction of the dike embankment.

3.7.4 Dike Fill Payment

Payment for dike fill will be made at the Contract Unit Price for Bid Item No. 3, "Dike Fill" which shall constitute full compensation to the Contractor for all costs associated with the surveys, operation of the on-site borrow source, and drying, hauling, placement and compaction of the dike fill in accordance with the requirements of this Section, including the required submittals and testing.

3.7.5 Roadway Aggregate

There shall be no measurement or payment for the roadway aggregate and all costs in connection with placement of the roadway aggregate shall be considered incidental to Bid Item No. 1, "Sluice Access Roadway".

3.7.6 Sluice Relocation Backfill

There shall be no measurement or payment for materials used as backfill during relocation of the sluice and installation of the additional section of outlet pipe. All costs in connection with placement of the backfill shall be considered incidental to Bid Item No. 4, "Sluice Relocation" as specified in Section 02380.

3.7.7 GCL Cover Soil

Measurement for the GCL cover soil shall be based on the cubic yards of material placed as indicated by the area and thickness indicated on the Contract Drawings. All costs in connection with placement of the GCL cover soil shall be made at the Contract Unit Price for Bid Item No. 3, "Dike Fill," which shall constitute full compensation to the Contractor for all costs associated with the surveys, operation of the on-site borrow source, and drying, hauling, placement and compaction of the GCL cover soil in accordance with the requirements of this Section, including the required testing.

-- End of Section --

SECTION 02370

GEOTEXTILES

PART 1 GENERAL

1.1 SUMMARY

The work of this section shall include: placement of the reinforcement geotextile on the prepared dike foundation, prior to placement of dike fill materials; **placement of the geosynthetic clay liner (GCL) on the landfill slope**; placement of the roadway geotextile on the prepared roadway base, prior to placement of the graded aggregate; and placement of the sluice geotextile, prior to placement of the sluice backfill, as indicated on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 123	(1993a) Standard Terminology Relating to Textiles
ASTM D 2216	(1996) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 4355	(1992) Deterioration of Geotextile from Exposure to Ultraviolet light and Water (Xenon-Arc Type Apparatus)
ASTM D 4595	(2001) Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4643	(1993) Determination of Water (Moisture) Content of Soil by the Microwave Oven Method
ASTM D 4873	(1988) Guide for Identification, Storage, and Handling of Geotextiles
ASTM D 4884	(1996) Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles
ASTM D 5321	(1992) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and

Geosynthetic Friction by the Direct Shear Method

<i>ASTM D 5887</i>	<i>(1995) Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter</i>
<i>ASTM D 5888</i>	<i>(1995) Storage and Handling of Geosynthetic Clay Liners</i>
<i>ASTM D 5889</i>	<i>(1995) Quality Control of Geosynthetic Clay Liners</i>
<i>ASTM D 5890</i>	<i>(1995) Swell Index of Clay Mineral Component of Geosynthetic Clay Liners</i>
<i>ASTM D 5891</i>	<i>(1995) Fluid Loss of Clay Component of Geosynthetic Clay Liners</i>
<i>ASTM D 5993</i>	<i>(1996) Measuring Mass Per Unit of Geosynthetic Clay Liners</i>

1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

GCL Properties; G COR.

The GCL manufacturer's certified raw and roll material data sheets. The certification shall indicate that the GCL has been continuously inspected for broken needles using an in-line metal detector and all broken needles have been removed. The certified data sheets shall be attested to by a person having legal authority to bind the GCL manufacturing company. Certified test results, along with a sample of the GCL to be used on this project measuring a minimum of 12 inches by 12 inches, shall be submitted at least 5 working days prior to delivery of the GCL.

GCL Warranty; FIO.

The GCL manufacturer's warranty statement.

SD-08 Statements

Reinforcement Geotextile Seaming Work Plan;G COR

The Contractor shall prepare a Reinforcement Geotextile Seaming work plan for approval at least 30 days prior to the dike construction activities. This plan shall include the equipment, thread and techniques to be used to seam the Type I: Reinforcement Geotextile.

GCL Work Plan; G COR

The Contractor shall prepare a GCL Work Plan outlining the proposed methods and equipment to be used for installation of the GCL and placement of the GCL cover soils as required by the Contract Drawings and this Specification. This work plan shall include details regarding the proposed methods for preparation of the surfaces to receive the GCL; a panel layout for the proposed installation; installation of the GCL on the slopes, including methods and details for the anchor trenches, overlaps and for installing the GCL around obstructions in the slope, if required; and placement of the GCL cover soils. This plan shall be submitted to the Contracting Officer for review and approval a minimum of 14 calendar days prior to the start of GCL subgrade preparation activities.

SD-09 Reports

GCL Conformance Tests; G COR.

Independent QC laboratory test results for the GCL including descriptions of equipment and test methods.

SD-13 Certificates

Reinforcement Geotextile Certification; G COR.

The Contractor shall submit for approval a certification of the reinforcement geotextile material from the manufacturer, along with a sample of the geotextile to be used on this project, measuring a minimum of 12 inches by 12 inches, at least 30 days prior to delivery of the geotextile. The geotextile to be used shall be accepted on the basis of mill certificates or affidavits. The Contractor shall furnish the Contracting Officer, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

Roadway Geotextile Certification; G COR.

The Contractor shall submit for approval a certification of the roadway geotextile material from the manufacturer, along with a sample of the geotextile to be used on this project, measuring a minimum of 12 inches by 12 inches, at least 30 days prior to delivery of the geotextile. The geotextile to be used shall be accepted on the basis of mill certificates or affidavits. The Contractor shall furnish the Contracting Officer, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

Sluice Geotextile Certification; G COR.

The Contractor shall submit for approval a certification of the sluice geotextile material from the manufacturer, along with a sample of the geotextile to be used on this project, measuring a minimum of 12 inches by 12 inches, at least 30 days prior to delivery of the geotextile. The geotextile to be used shall be accepted on the basis of mill certificates

or affidavits. The Contractor shall furnish the Contracting Officer, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

SD-14 Samples

Reinforcement Geotextile Samples; G COR.

If requested by the Contracting Officer, the Contractor shall provide to the Government reinforcement geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 30 days prior to the beginning of installation of the geotextile. A written certificate of compliance signed by a legally authorized official from the company shall be submitted, in duplicate, upon delivery of the geotextile. The certificate shall state that the geotextile shipped to the site meets the chemical requirements and exceeds the minimum average roll value listed in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR REINFORCEMENT GEOTEXTILE. Upon request, the contractor shall supply quality control and quality assurance test results for the reinforcement geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long. Samples submitted for testing shall be identified by manufacturers lot designation. The manufacturer shall certify that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

Roadway Geotextile Samples; G COR.

If requested by the Contracting Officer, the Contractor shall provide to the Government roadway geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 14 days prior to the beginning of installation of the geotextile. A written certificate of compliance signed by a legally authorized official from the company shall be submitted, in duplicate, upon delivery of the geotextile. The certificate shall state that the geotextile shipped to the site meets the chemical requirements and exceeds the minimum average roll value listed in TABLE 2, MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE. Upon request, the contractor shall supply quality control and quality assurance test results for the roadway geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long. Samples submitted for testing shall be identified by manufacturers lot designation. The manufacturer shall certify that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

Sluice Geotextile Samples; G COR.

If requested by the Contracting Officer, the Contractor shall provide to the Government sluice geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 14 days prior to the beginning of installation of the geotextile. A written certificate of compliance signed by a legally authorized official from the company shall be submitted, in duplicate, upon delivery of the geotextile.

The certificate shall state that the geotextile shipped to the site meets the chemical requirements and exceeds the minimum average roll value listed in TABLE 2, MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE. Upon request, the contractor shall supply quality control and quality assurance test results for the sluice geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long. Samples submitted for testing shall be identified by manufacturers lot designation. The manufacturer shall certify that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

1.4 QUALIFICATIONS

The geosynthetic clay liner shall be the product of a GCL Manufacturer who has produced the proposed GCL using the same bentonite, geotextiles, sewing thread, and adhesive for at least 5 completed projects and shall have produced a minimum of 1,000,000 square feet of the proposed GCL.

1.5 SHIPMENT, HANDLING, AND STORAGE

1.5.1 Geotextile

Only approved geotextile rolls shall be delivered to the project site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

1.5.2 Geosynthetic Clay Liner

1.5.2.1 Delivery

Delivery, storage, and handling of GCL shall be in accordance with ASTM D 5888. The Contracting Officer shall be present during delivery and unloading of the GCL. Rolls shall be packaged in an opaque, waterproof, protective covering and wrapped around a central core. Tears in the packaging shall be repaired to restore a waterproof protective barrier around the GCL. Unloading of rolls from the delivery vehicles shall be done preventing damage to the GCL and its packaging.

1.5.2.2 Storage

Field storage shall be in flat dry areas where water cannot accumulate and the GCL rolls can be protected from damage. Storage of the rolls on blocks or pallets will not be allowed unless the GCL rolls are fully supported as approved by the Contracting Officer. Stacks of GCL rolls shall be no greater than three high. Rolls shall be covered with a water proof tarpaulin or plastic sheet if stored outdoors.

1.5.2.3 Handling

Rolls shall not be dragged, lifted by one end, or dropped to the ground from the delivery vehicle. A pipe or solid bar of sufficient strength to support the full weight of the roll without significant bending shall be used for all unloading and handling activities. The diameter of the pipe shall be small enough to be easily inserted through the core of the GCL

roll. Chains shall be used to link the ends of the core pipe to the ends of a spreader bar. The spreader bar shall be wide enough to prevent the chains from rubbing against the ends of the GCL roll. Alternatively, a stinger bar protruding from the end of a forklift or other equipment may be used. The stinger bar shall be at least three-fourths the length of the core and also must be capable of supporting the full weight of the GCL without significant bending. If recommended by the manufacturer, a sling handling method utilizing appropriate loading straps may be used.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Geotextiles

2.1.1.1 Type I: Reinforcement Geotextile

The reinforcement geotextile shall be a woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall equal or exceed the minimum average roll values listed in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR REINFORCEMENT GEOTEXTILE. Strength values indicated in the table are for the stronger principal direction.

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR REINFORCEMENT GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
WIDE WIDTH TENSILE STRENGTH	lb/in	1200	ASTM D 4595
SEAM STRENGTH STRENGTH (CMD)	lb/in	200	ASTM D 4884
ULTRAVIOLET DEGRADATION	Percent	70 AT 500 Hrs	ASTM D 4355

2.1.1.2 Type II: Roadway Geotextile

The roadway geotextile shall be a woven, pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall equal or exceed the minimum average roll values listed in TABLE 2, MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE. Minimum ultimate strength values shall be achieved in the machine and the cross directions.

TABLE 2
MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
WIDE WIDTH TENSILE STRENGTH	lb/in	400	ASTM D 4595
ULTRAVIOLET			

TABLE 2
MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE
DEGRADATION Percent 70 AT 500 Hrs ASTM D 4355

2.1.1.1.3 Sluice Geotextile

The sluice geotextile shall meet or exceed all of the requirements specified in Paragraph 2.1.1.2 for the Type II: Roadway Geotextile.

2.1.1.1.4 Geotextile Fiber

Fibers used in the manufacturing of the geotextiles shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

2.1.2 Geotextile Seams

All seams in the reinforcement geotextile shall be oriented transverse (perpendicular) to the dike centerline. All seams shall be sewn with a SSA-1, "Flat" or "Prayer" seam, with a 401 two-threaded chain stitch, **or as required to achieve the minimum strength indicated in Table 1.** Thread shall be polyolifin (polyester or propylene). Overlap of adjacent rows of reinforcement geotextile, in lieu of sewn seams shall not be permitted.

2.1.3 Geosynthetic Clay Liner

The GCL shall be a manufactured product consisting of a sodium montmorillonite clay (bentonite) layer evenly distributed between two geotextiles. The GCL shall conform to the property requirements listed in Table 3 and shall be free of tears, holes, or other defects which may affect its serviceability. Encapsulating geotextiles shall be mechanically bonded together using a needle punch or stitch bonding process. The GCL shall be continuously inspected for broken needles using an in-line metal detector and broken needles shall be removed. The minimum manufactured GCL sheet width shall be 13.5 feet and the minimum manufactured GCL sheet length shall be 98 feet.

TABLE 3 - GCL PROPERTIES

	TEST METHOD	TEST VALUE
<hr/>		
BENTONITE		
<i>Swell Index Test, minimum</i>	<i>ASTM D 5890</i>	<i>0.000848 cubic ft (24 mL)</i>
<i>Fluid Loss, maximum</i>	<i>ASTM D 5891</i>	<i>0.000636 cubic ft (18 mL)</i>

TABLE 3 - GCL PROPERTIES

	TEST METHOD	TEST VALUE
COMPOSITE		
Bentonite Mass/Unit Area, MARV, Notes 1 and 2	ASTM D 5993	0.75 lbs/sq foot (3.6 kg/sq m)
Tensile Strength, MARV	ASTM D 4632	150 lbs/in (26 kN/m)
Peak Mid-Plane Shear Strength (hydrated), minimum at a normal stress of 200 psf	ASTM D 5321	500 psf (24 kPa)
Index Flux, maximum	ASTM D 5887	.000000033 cubic ft/sq ft/sec (.00000001 cubic m/sq m/sec)
Peel Strength, MARV	ASTM D 4632	15 lbs. (65 N)

Note 1: MARV = minimum average roll value.

Note 2: Bentonite mass/unit area shall be computed at 0 percent moisture content. Moisture content shall be determined by ASTM D 2216 or ASTM D 4643. Bentonite mass/unit area is exclusive of glues added to the bentonite.

2.2 INSPECTIONS, VERIFICATIONS, AND TESTING

2.2.1 Geotextile Manufacturing and Sampling

2.2.1.1 Type I: Reinforcement Geotextile

The reinforcement geotextile shall meet the requirements specified in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR REINFORCEMENT GEOTEXTILE.

2.2.1.2 Type II: Roadway Geotextile

The roadway geotextile shall meet the requirements specified in TABLE 2, MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE.

2.2.1.3 Sluice Geotextile

The sluice geotextile shall meet the requirements specified in TABLE 2, MINIMUM PHYSICAL REQUIREMENTS FOR ROADWAY GEOTEXTILE.

2.2.2 GCL Manufacturing Sampling and Testing

The GCL and its components shall be sampled and tested in accordance with the GCL manufacturer's approved QC manual. The GCL manufacturer's QC

procedures shall be in accordance with ASTM D 5889. Test results not meeting the requirements specified in Table 3 shall result in the rejection of applicable rolls. The GCL manufacturer's QC manual shall describe procedures used to determine rejection of applicable rolls. As a minimum, rolls produced immediately prior to and immediately after the failed roll shall be tested for the same failed parameter. Testing shall continue until a minimum of three successive rolls on both sides of the original failing roll pass the failed parameter.

PART 3 EXECUTION

3.1 INSTALLATION OF THE GEOTEXTILE

3.1.1 General

The geotextile shall be placed in the manner and at the locations indicated on the Contract Drawings. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.1.2 Surface Preparation for the Geotextile

Surfaces on which the reinforcement and roadway geotextile are to be placed shall be compacted prior to the placement of the geotextile. Surfaces to be compacted shall be free of standing water, ruts and unnecessary roughness. The surfaces shall be compacted by not less than eight passes of a sheepsfoot roller, where a pass is defined as a pass in one direction. The sheepsfoot roller shall have a minimum 100 ton vibratory capacity. However the compaction shall be performed in the static mode. Each pass of the roller shall overlap the preceding or adjacent pass by not less than one foot. All surfaces on which the geotextile is to be placed shall be prepared to a relatively smooth surface condition, in accordance with the applicable portion of this specification and shall be free from obstruction, debris, depressions, erosion feature, or vegetation. Any irregularities will be removed so as to insure continuous, intimate contact of the geotextile with all the surface. Any loose material, soft or low density pockets of material, will be removed; erosion features such as rills, gullies etc. must be graded out of the surface before geotextile placement.

3.1.3 Placement of the Reinforcement Geotextile

The reinforcement geotextile shall be placed with the principle strength dimension perpendicular to the longitudinal centerline of the embankment and laid smooth and free of tension, stress, folds, wrinkles, or creases. A continuous strip shall be placed from one side of the embankment to the other, so that there are no joints parallel to the embankment. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. The geotextile shall be placed to provide a minimum width of overlap for each joint, as recommended by the manufacturer for seaming. Temporary pinning of the geotextile to help hold it in place until the sewing is completed shall be allowed. The temporary pins shall be removed as the the geotextile is sewn. Trimming shall be performed in such a manner that the geotextile shall not be damaged in any way.

3.1.4 Placement of the Roadway Geotextile

The roadway geotextile shall be placed with the long dimension parallel to the centerline of the roadway. Overlap of the roadway geotextile shall be permitted in either direction. Overlap shall be in accordance with Paragraph 3.1.6, Roadway Geotextile Overlap. Temporary pinning of the geotextile until placement of the roadway aggregate thereon will be permitted. However, the temporary pins shall be removed as the roadway aggregate is placed on the geotextile to relieve the high tensile stress which may occur.

3.1.5 Installation of the Sluice Geotextile

The sluice geotextile shall be placed in the sluice excavation as indicated on the Contract Drawings. Overlap of the sluice geotextile shall be permitted in either direction. Overlap shall be in accordance with Paragraph 3.1.7 Roadway and Sluice Geotextile Overlap

3.1.6 Protection of the Geotextile

Any damage to the geotextile during its installation or during placement of dike fill, roadway aggregate, or sluice backfill shall be replaced by the Contractor at no additional cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 10 working days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of dike fill, roadway aggregate, and sluice backfill. Before placement of dike fill, roadway aggregate, and sluice backfill, the Contractor shall demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

3.1.7 Roadway and Sluice Geotextile Overlap

The overlap of roadway and sluice geotextile rolls shall be 24 inches. Appropriate measures will be taken to insure required overlap exists after the roadway aggregate and sluice backfill placement.

3.2 INSTALLATION OF THE GCL

3.2.1 Subgrade Preparation for GCL

Prior to the start of subgrade preparation for the GCL, a survey shall be performed to determine the existing ground surface elevations along the landfill slopes, and in the vicinity of the Cherry Island Landfill pump station located along Reach C and identified on the Contract Drawings. These elevations shall be used to determine the required extent of the GCL to be placed, based on the top and bottom elevations provided on the Contract Drawings. As indicated on the Contract Drawings, the Limit of Disturbance in the vicinity of the pump station shall be such that no disturbance of the landfill shall be performed within 25 feet of the pump station. The survey shall be performed under the guidance of a surveyor licensed by the State of Delaware. The Contractor shall be responsible for all costs associated with the survey.

Surfaces on which the GCL is to be placed shall be stripped of vegetation and compacted prior to the placement of the GCL. Surfaces to be compacted shall be free of standing water, ruts and unnecessary roughness. The

surfaces shall be compacted by not less than four passes of a smooth drummed roller, where a pass is defined as a pass in one direction. Each pass of the roller shall overlap the preceding or adjacent pass by not less than one foot. All surfaces on which the GCL is to be placed shall be prepared to a relatively smooth surface condition, in accordance with the applicable portion of this specification and shall be free from obstruction, debris, depressions, erosion feature, or vegetation. Any irregularities will be removed so as to insure continuous, intimate contact of the GCL with all the surface. Any loose material, soft or low density pockets of material, will be removed; erosion features such as rills, gullies etc. must be graded out of the surface before GCL placement.

3.2.2 GCL Placement

The GCL shall be placed on the landfill slope, as indicated on the Contract Drawings. The slopes along which the GCL will be placed shall be smooth and free of vegetation, standing water, frozen material, and angular stones or other foreign matter that could damage the GCL. Prior to the placement of any portion of the GCL, the Contracting Officer shall review the subgrade on which the GCL is to be placed to confirm that it meets the requirements of this Section. The GCL shall be installed as soon as practical after approval of the subgrade, but, the GCL shall not be deployed if any portion of the subgrade is frozen. Immediately prior to deployment, the packaging shall be carefully removed without damaging the GCL. GCL which has been hydrated prior to the placement of the GCL cover soil shall be removed and replaced. Hydrated GCL is defined as material which has become soft as determined by squeezing the material with finger pressure or material which has exhibited swelling. The GCL shall be placed along the prepared subgrade using a spreader bar, which shall support the weight of the GCL until the placement of the GCL cover soil along that portion of the slope is complete. Joining of panels in the horizontal direction shall not be allowed. Dragging of GCL panels over the ground surface shall be minimized. Deployed GCL panels shall lie flat against the prepared subgrade, with no wrinkles or folds. The GCL panels shall be anchored as indicated on the Contract Drawings.

3.2.3 GCL Overlapping

Adjacent panels shall be positioned with the overlap recommended by the manufacturer, but not less than 12 inches after shrinkage for panel sides. Dirt or other foreign matter shall be removed from the overlap area. Construction adhesive or other methods, as recommended by the manufacturer, shall be used for joining adjacent panels.

3.2.4 Anchor Trenches

The GCL anchor trenches shall be constructed to the dimensions indicated on the Contract Drawings. The thickness of the existing cover soils on the landfill slopes is anticipated to be variable along Reach C. Therefore, the potential exists for encountering municipal solid waste in the anchor trench excavations. If municipal solid waste is encountered during anchor trench construction, the Contractor shall immediately notify the Contracting Officer, who will provide direction to the Contractor regarding any required modifications to the anchor trench detail at that location.

3.2.5 Protection

Only those GCL panels which can be placed and covered in the same day shall be unpackaged and installed.

3.2.6 Repairs

Holes or tears in GCL shall be repaired by placing a patch of GCL extending a minimum of 12 inches beyond the edges of the hole or tear on all sides. Bentonite mastic shall be applied in the overlap area at a minimum application rate of one pound per lineal foot. Patches shall be secured with a construction adhesive or other approved methods as recommended by the manufacturer.

3.2.7 Penetrations

Penetrations through the GCL, if required, shall be performed in accordance with the manufacturers recommendations and the approved GCL Work Plan.

3.3 MEASUREMENT AND PAYMENT

3.3.1 Reinforcement Geotextile

Installed reinforcement geotextile will be measured for payment in place to the nearest square feet of protected area as delineated on the Contract Drawings. Payment shall be made at the Contract Unit Price for Bid Item No. 2 "Geotextile Reinforcement," and shall constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile reinforcement, including preparation of the seaming work plan. No payment will be made for geotextile overlaps. The following items are included in the Contract Unit Price for Geotextile Reinforcement and shall not be counted a second time in the process of determining the extent of geotextile placed: Material and associated equipment and operation used in laps and seaming; and securing pins and associated material, equipment, and operations. No payment will be made for geotextiles replaced because of waste, contamination, damage, repair, or due to contractor fault or negligence.

3.3.2 Roadway Geotextile

There shall be no measurement or payment for the roadway geotextile and all costs in connection with the installation of the roadway geotextile shall be considered incidental to Bid Item No. 1, "Sluice Access Roadway".

3.3.3 Sluice Geotextile

There shall be no measurement or payment for the sluice geotextile and all costs in connection with the installation of the sluice geotextile shall be considered incidental to Bid Item No. 4, "Sluice Relocation" as specified in Section 02380.

3.3.4 Geosynthetic Clay Liner

Installed GCL will be measured for payment in place to the nearest square foot. The installed area shall be calculated using the length of covered

slope as determined by the pre-placement survey of the landfill slopes and width of the covered slope as delineated on the Contract Drawings. Payment shall be made at the Contract Unit Price for Bid Item No. 5 "Geosynthetic Clay Liner," and shall constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the GCL, including the pre-placement survey, overlaps, penetrations and anchor trenches. The material and associated equipment and operation used in laps, anchor trenches and joining adjacent panels shall be included in the Contract Unit Price for Geosynthetic Clay Liner and shall not be counted a second time in the process of determining the extent of GCL placed. No payment will be made for GCL replaced because of waste, contamination, damage, repair, or due to contractor fault or negligence.

-- End of Section --

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

PROJECT TABLE OF CONTENTS

<u>SECTION NO.</u>	<u>TITLE</u>
DIVISION 1 - GENERAL REQUIREMENTS	
01010	SUMMARY OF WORK
01060	SAFETY
01320	CONSTRUCTION PHOTOGRAPHY
01325	PROJECT SCHEDULE
01330	SUBMITTAL PROCEDURES
01355	ENVIRONMENTAL PROTECTION
01420	SOURCES FOR REFERENCE PUBLICATIONS
01450	CONTRACTOR QUALITY CONTROL (CQC)
01500	TEMPORARY CONSTRUCTION
01580	PROJECT AND SAFETY SIGNS
01780	AS-BUILT DRAWINGS
DIVISION 2 - SITE WORK	
02230	SITE CLEARING
02300	EARTHWORK
02370	GEOTEXTILE
02380	SLUICE RELOCATION
02700	SETTLEMENT PLATES
02921	SEEDING

--End of Project Table of Contents--